“WHAT GETS MEASURED GETS DONE”: A SOLAR ENERGY PROJECT ANALYSIS FOR REFORMING THE PUBLIC LAND PROJECT APPROVAL PROCESS

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A capstone submitted to Johns Hopkins University in conformity with the requirements for the degree of Master of Science in Energy Policy and Climate

Baltimore, Maryland
April 2018

Executive Summary

The National Environmental Policy Act (NEPA) mandates federal agencies to consider any "significant" impact on the environment a major energy or infrastructure project will have on public lands before proceeding with development. Yet core challenges have stalled the approval process including data synthesis, multi-agency and multi-level jurisdiction, and required public involvement. According to the National Association of Environmental Professionals, the average completion time for Environmental Impact Statements is five years. The opportunity costs associated with delays in development are critical for the transition to a clean energy economy.

The Trump Administration has exhibited an earnestness to streamline NEPA approvals of infrastructure and energy development projects. In August 2017, the Administration released Executive Order 13807 emphasizing a lead agency policy and setting a non-binding average two-year goal for processing reviews of individual projects. When considering how thoroughly vetted major project approvals are, restrictive scoping and time limits are serious matters for discussion.

In 2012, the Solar Programmatic Environmental Impact Statement (PEIS) was established to promote development in the Southwestern region by catalyzing solar energy applications on resourceful lands. Since three projects have gained approval in 9 months' time. This capstone investigated the quantitative and qualitative merits of investing in solar programmatic planning. Twenty-five NEPA authorized solar energy projects were found to have a positive correlation between their approved power and the time per megawatt (MW) required for approval. The higher the recommended power, the less time each MW required for analyzing. The three environmental assessments tiered from the PEIS were evaluated based on public commentary periods, competitive bidding, and overall process. This capstone found that broad scale scoping rather than time limits will yield best results in streamlining the NEPA process.

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Introduction

Over the past decade, the energy sector has experienced a surge in the growth of renewable generation development unmatched by previous decades of electricity system reform. According to the National Renewable Energy Lab's Renewable Energy Data Book, U.S. annual electricity generation from solar and wind energy increased twelve-fold between 2005 and 2015.[1] The explosive growth in renewable integration has been due to considerable cost reductions in manufacturing, red tape, and the improved efficiency of solar cells. Solar energy generation is quickly reaching grid parity in portions of the United States, such as the Southwest where abundant solar radiation resources exist, as a coinciding effect of better economic favor.[2]

The most promising initiative to continue the drive towards a clean energy economy may now be federal: renewable energy deployment on public lands. The Department of the Interior (DOI) utilizes leasing strategies to site renewable energy development projects in cooperation with other responsible agencies such as the Department of Energy (DOE), the Bureau of Indian Affairs, and the Bureau of Land Management (BLM). Of the estimated 640 million acres of federal land, the BLM manages 248.3 million acres.[3] The BLM and Congress' joint jurisdiction covers over 10 percent of U.S. land area. According to the DOE, the development of solar photovoltaic energy on 0.6 percent of the nation's land mass could supply power to every home in the nation given sufficient energy storage and energy demand management.[4]

[1] U.S. Department of Energy. 2015 Renewable Energy Data Book. 2016. http://www.nrel.gov/docs/fy17osti/66591.pdf
[2] World Resources Institute. "United States Solar Radiation Map." 2009. http://www.wri.org/resources/maps/united-states-solar-radiation-map
[3] Carol Hardy Vincent, et al. "Federal Land Ownership: Overview and Data." Congressional Research Service. March 3, 2017. https://fas.org/sgp/crs/misc/R42346.pdf
[4] U.S. Department of Energy. "Solar Energy in the United States." 2018. https://www.energy.gov/eere/solarpoweringamerica/solar-energy-united-states

The National Environmental Policy Act

The interest in deploying solar generation on public lands has emanated from years of policymaking. In 1969, a new era of conscientious decision making for developing public lands began when a landmark environmental law, titled the National Environmental Policy Act (NEPA), was enacted thereby strengthening environmental protection and promotion.[5] The legislation followed growth in public support for the environment in the 1960s which culminated in the demand for more federal oversight.

NEPA policies included the creation of the Council on Environmental Quality (CEQ) within the Executive Office of the President to guide federal agencies on the newly established requirement to prepare an array of compliance documents including environmental impact statements (EISs) and environmental assessments (EAs). An environmental analysis therein became a pre-requisite for any major project involving federal funding, federal work, or construction on public lands.[6]

[5] National Environmental Policy Act of 1969. Pub. L. 91–190. Approved January 1, 1970. 42 U.S.C. § 4321 Sec 2. Retrieved from https://www.gpo.gov/fdsys/pkg/STATUTE-83/pdf/STATUTE-83-Pg852.pdf
[6] Ibid.

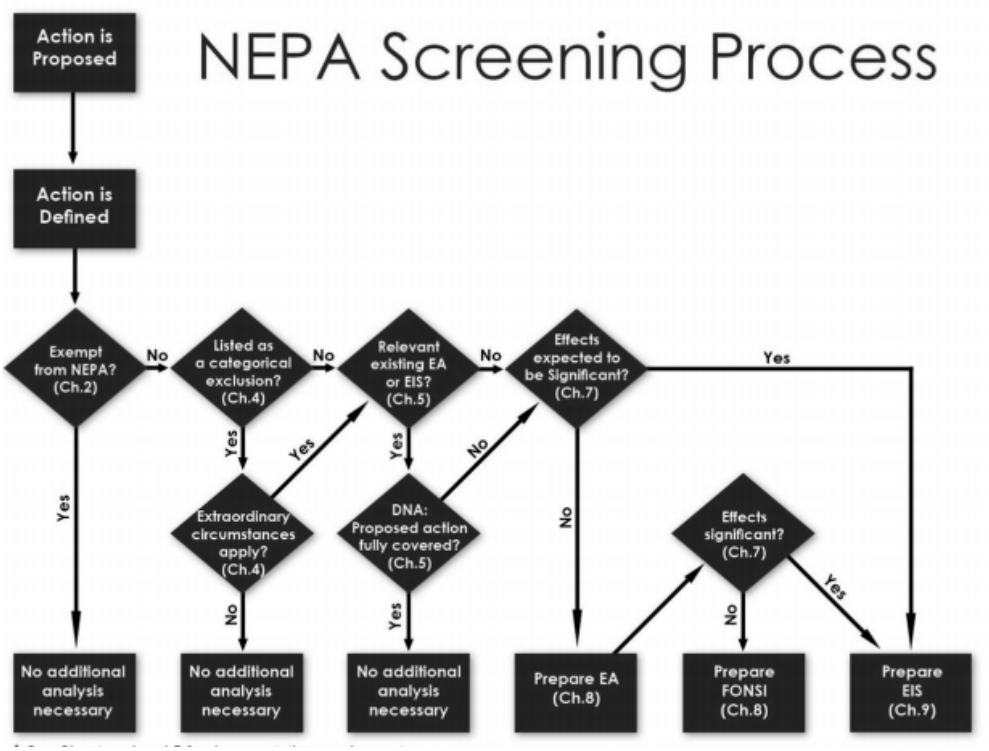

Figure 1. Preliminary Scoping. *Figure courtesy of the Department of the Interior.*[7]

According to the Government Accountability Office, less than 1 percent of NEPA analyses require EIS approval, but the projects that do are likely to be "high-profile, complex, and expensive" with "significant" environmental issues requiring intensive analysis.[8] A major difference between an EIS and an EA rests in the public review and comment process including scoping hearings prior to EISs' starts and public hearings for commentary on any draft EIS.[9] NEPA mandated that federal agencies prepare EISs or EAs to base their project approvals partially on potential environmental outcomes. Legislators believed that through thoughtful decision making, vetted by public participation and researched alternatives (including a no

[7] The U.S. Department of the Interior. "The BLM NEPA Handbook h-1790-1." January 2008. https://openei.org/w/images/1/1e/H1790-1-2008-1.pdf
[8] U.S. Government Accountability Office. "National Environmental Policy Act: Little Information Exists on NEPA Analyses." GAO-14-370. April 15, 2014. https://www.gao.gov/products/GAO-14-370.
[9] CSA Ocean Sciences. "Environmental Impact Assessments (EIA)." 2018. https://www.csaocean.com/services/environmental-impact-assessment-eia

project alternative), the probability of negative consequences would likely be diminished. All in all, NEPA has established a more democratic system for the selection of public land utilization.

However, NEPA has received its fair share of negative feedback principally based on its broad guidelines. As a statute focused on the process of environmental awareness, NEPA does not address specific project related topics such as energy generation or infrastructure development. Concomitantly, CEQ has mandated that guidelines be followed by the involved federal agencies without specific documentation templates. However, the review processes of each agency varies, and these variations can cause undue overlapping and delays in processing forms due to a lack of regulation or uniformity in documentation.

Federal Reforms to the Process

When permitting different federal agencies with varying issue concerns to interpret guidelines to establish procedural structures of their own, it should not come as a surprise that time loss may become a byproduct of such a fragmented machine. In August 2016, the National Association of Environmental Professionals (NAEP) released a report on EIS completion rates. Figure 2, courtesy of the NAEP Annual NEPA Report, reveals the steady increase in preparation times for finalized EIS reports amongst all federal agencies. The average preparation time of 1841 days (5.04 years) from the Notice of Intent (NOI) to the Notice of Availability for an EIS in the Federal Register was the longest recorded for all agencies from 1997-2015.[10] The DOI's average preparation time was 1858 days (5.09 years).[11]

[10] National Association of Environmental Professionals. "Annual NEPA Report 2015 of the National Environmental Policy Act (NEPA) Practice." August 2016. https://ceq.doe.gov/docs/get-involved/NAEP_2015_NEPA_Annual_Report.pdf
[11] Ibid., 14.

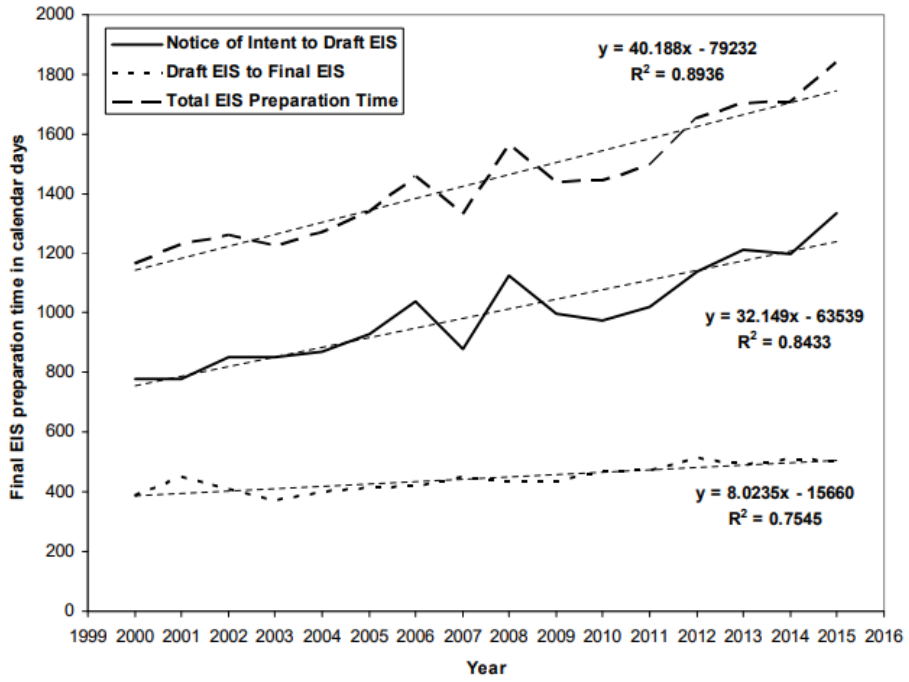

Figure 2. Annual Average Preparation Times for Final EISs from 2000 to 2015. *Figure courtesy of the NAEP.*[12]

Increasing timespans for approving EIS reports have come to the attention of CEQ and action has been taken by federal agencies. Concurrently, Congress and the Executive Branch have sought to correct the inefficiencies of NEPA through more targeted legislation and mandates.

In Section 211 of the Energy Policy Act of 2005, Congress instructed the Secretary of the DOI to install 10,000 megawatts (MW) of renewable energy projects on public lands by 2015.[13] Following the mandate and a renewed call to action by the Obama Administration, the BLM instituted a "fast track" process in which existing applications became the priority for the agency

[12] Ibid., 18
[13] Federal Energy Regulatory Commission. "Energy Policy Act of 2005." Pub. L. 109–58 (August 8, 2005). https://www.ferc.gov/enforcement/enforce-res/EPAct2005.pdf

allowing for 3,600 MW of solar-generated electricity to be approved by the end of 2010.[14] The Obama Administration's "Smart from the Start" policies improved early consultation and transparency within the environmental analysis stage thereby clarifying NEPA documentation requirements and expectations.[15] By 2012, the 10,000 MW goal was met.[16]

As part of the Obama Administration's Climate Action Plan, DOI was further instructed to install 20,000 MW of major renewable generation projects on public lands by 2020.[17] Due to the initiatives that were implemented to support the Climate Action Plan, part of President Obama's legacy has become his embrace of clean energy and environmental protection.[18]

Now, the Trump Administration seeks to reform the NEPA process in order to push through major energy and infrastructure projects. "Streamlining" has been cited by the President as the way to fix a "badly broken" system.[19] An initiative to enhance accountability through the One Federal Decision procedure, in which one federal agency leads the environmental review, came with the release of Executive Order 13807 in August 2017.[20] The Administration has

[14] Robert V. Abbey. "Wind and Solar Energy Roadblocks on Public Lands." May 13, 2011. https://www.doi.gov/ocl/hearings/112/AmericanEnergyInitiativeAbbey_051311
[15] Ibid.
[16] Department of the Interior. "The Bureau Of Land Management's Determination Processes for Wind Energy Projects Proposed on Public Lands." December 2015. https://www.doioig.gov/sites/doioig.gov/files/2015EAU037Public.pdf
[17] Department of the Interior. "Interior Department Finalizes Rule Providing a Foundation for the Future of BLM's Renewable Energy Program." November 10, 2016. https://www.doi.gov/pressreleases/interior-department-finalizes-rule-providing-foundation-future-blms-renewable-energy
[18] Elizabeth Shogren. "Obama's Energy Legacy in the West Could Outlast the Trump Administration." Wired. January 4, 2017. https://www.wired.com/2017/01/obamas-energy-legacy-west-outlast-trump-administration/
[19] Lisa Friedman. "Trump Signs Order Rolling Back Environmental Rules on Infrastructure." New York Times. August 15, 2017. https://www.nytimes.com/2017/08/15/climate/flooding-infrastructure-climate-change-trump-obama.html
[20] Presidential Documents. "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects, Executive Order 13807 of August 15, 2017." Federal Register 82, no. 163 (August 24, 2017). https://www.energy.gov/sites/prod/files/2017/09/f36/EO-13807.pdf

signaled for the modification of processes to develop energy production and generation including "fossil, renewable, nuclear and hydro sources" with an average EIS approval rate of two years.[21]

DOI issued Interior Secretarial Order 3355 in response to the target goals of Executive Order 13807. The Order intended to make NEPA recommended limits mandatory concerning document lengths and review times.[22] Amongst the directives, EISs would be no longer than 150 pages when DOI acts as the lead agency.[23] A more aggressive one-year target goal for EIS completion upon issuance of the NOI usurped the two-year target designated by the Administration's Order.[24]

Executive Order 13807 follows Executive Order 13212: Actions to Expedite Energy-Related Projects, released in May 2001 by the Bush Administration. Order 13212 instructed federal agencies to "to accelerate the completion of energy-related projects" by way of the Interagency Task Force headed by the Chairman of the CEQ.[25] Currently, there is a lack of political leadership in the CEQ as the Trump Administration has not filled the top position.[26] Executive Order 13807 comes after the Trump Administration's January 2017 release of Executive Order 13766: Expediting Environmental Reviews and Approvals for High Priority

[21] White House. "Presidential Executive Order on Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure." August 15, 2016. https://www.whitehouse.gov/presidential-actions/presidential-executive-order-establishing-discipline-accountability-environmental-review-permitting-process-infrastructure/

[22] Ryan Steen. "Recent Federal Actions to Streamline the NEPA Process." September 18, 2017. https://www.lawofrenewableenergy.com/2017/09/articles/regulation/president-trump-issued-executive-order-13807-titled-establishing-discipline-and-accountability-in-environmental-review-and-permitting-process-for-infrastructure-projects/

[23] Department of the Interior. "Secretary's Orders: 3355 – Streamlining NEPA Reviews and Implementation of EO 13807, "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects." September 1, 2017. https://elips.doi.gov/elips/0/doc/4581/Page1.aspx

[24] Ibid., 2.

[25] Presidential Documents. "Actions to Expedite Energy-Related Projects, Executive Order 13212 of May 18, 2001." Federal Register 66, no. 99 (May 22, 2001). http://solareis.anl.gov/documents/docs/eo13212.pdf

[26] Natasha Geiling. "Congress Has Been a Serious Ally for Trump's Anti-Environment Agenda." February 27, 2018. https://thinkprogress.org/congressional-republicans-environmental-scorecard-2017-dba844da6fb9/.

Infrastructure Projects in which the Chair of CEQ must coordinate with agency heads to establish expedited procedures for completing high priority projects.[27]

Pursuant to Executive Order 13807, the CEQ published an Initial List of Actions to Enhance and Modernize the Federal Environmental Review and Authorization Process in September 2017.[28] The announcement included updates and clarifications to existing CEQ regulations as well as a framework for implementing "One Federal Decision" in which one federal agency would issue an EIS for the entire federal government after leading other agencies through guidance and set timetables.[29]

According to parts 1501–1508 of NEPA, CEQ has the right to modify regulations although it likely will write new guidance in the form of a handbook. The CEQ document listed addressable issues for a new NEPA practitioner's handbook in which public involvement and "reliance on prior studies, analyses or decisions for projects within the same general locations" were emphasized.[30] The stress of these tactics for streamlining may reveal a programmatic prioritization amongst CEQ personnel.

On April 9, 2018, a Memorandum of Understanding implementing Executive Order 13807 was signed by a dozen agency chiefs, including those from DOE and DOI.[31]

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[27] Presidential Documents. "Expediting Environmental Reviews and Approvals for High Priority Infrastructure Projects, Executive Order 13766 of January 24, 2017." Federal Register 82, no. 18 (January 30, 2017). https://www.energy.gov/sites/prod/files/2017/01/f34/Req-EO13755expediting_env_reviews.pdf

[28] White House. "Council on Environmental Quality to Take Action to Enhance Environmental Review and Permitting Process for Infrastructure Projects." September 14, 2017. https://www.whitehouse.gov/sites/whitehouse.gov/files/ceq/CEQ-Fact%20Sheet_FRNotice_9-8-17.pdf

[29] Ibid.

[30] Council on Environmental Quality. Notice. "Initial List of Actions To Enhance and Modernize the Federal Environmental Review and Authorization Process." Federal Register 82, no. 43226 (September 14, 2017). https://www.federalregister.gov/documents/2017/09/14/2017-19425/initial-list-of-actions-to-enhance-and-modernize-the-federal-environmental-review-and-authorization#p-22

[31] Nick Sobczyk. "Agencies sign agreement to speed permitting." April 9, 2018. https://www-eenews-net.proxy1.library.jhu.edu/greenwire/stories/1060078515

Environmental groups including Earthjustice have expressed concern that the collaborative framework "could prompt lawsuits."[32]

Solar Projects on Public Lands

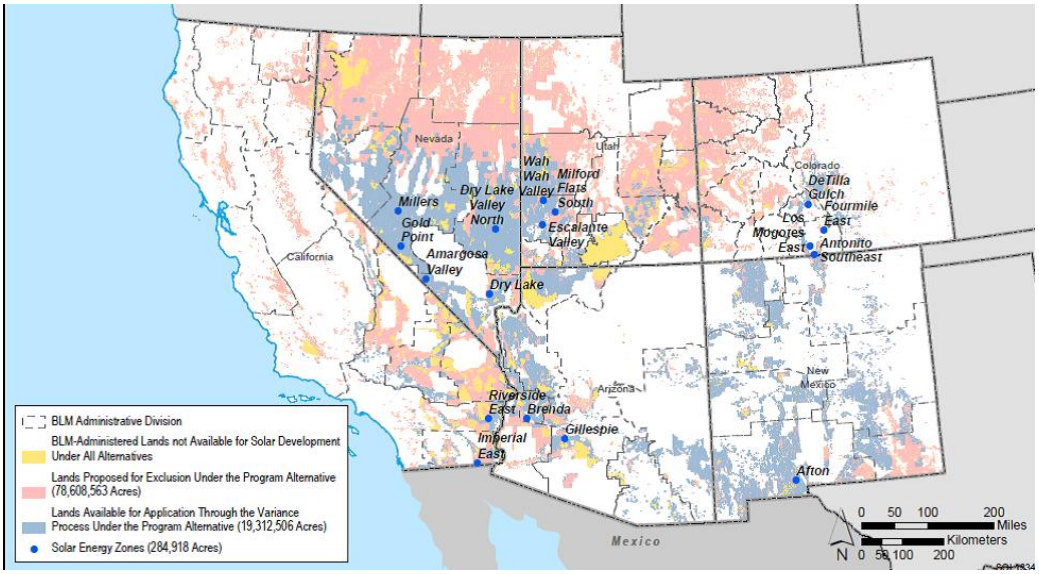
In March 2009, the Secretary of the Interior issued Secretarial Order No. 3285A1 announcing a policy goal to study, identify, and prioritize locations on public lands for utility-scale solar energy production.[33] The Order established a Departmental Task Force on Energy and Climate Change as well as clarifications on roles and responsibilities.[34] Soon after, a draft Programmatic Environmental Impact Statement (PEIS) prepared by BLM and DOI announced the consideration of solar energy study areas suitable for development as Solar Energy Zones (SEZs) in 2010.[35] The solar study areas entailed examination by agency officials seeking parcels at least 2,000 acres in size, situated near transmission and access roads to ease construction and connection while lacking in environmentally sensitive areas.[36] BLM mapped the areas using existing information including data on areas with a less than 5% slope and high solar radiation levels greater than 6.5 kilowatt-hours/meters^2/day.[37]

BLM created the PEIS to fulfill renewable energy generation obligations but also to plan for large-scale energy resource development through an expedited analysis process for projects

[32] Ibid.
[33] Solar Energy Development Programmatic EIS. "Why the Solar PEIS Is Needed." http://solareis.anl.gov/eis/why/index.cfm
[34] Department of the Interior. "Secretary's Orders: 3285A1-Renewable Energy Development by the Department of the Interior." https://elips.doi.gov/ELIPS/0/doc/151/Page1.aspx
[35] Department of Interior. Notices. "Notice of Availability of Maps and Additional Public Scoping for Programmatic Environmental Impact Statement To Develop and Implement Agency-Specific Programs for Solar Energy Development; Bureau of Land Management Approach for Processing Existing and Future Solar Applications." Federal Register 74, no. 124 (June 30, 2009). http://www.energy.ca.gov/reti/documents/phase2A/comments/Joe_Ross_Att-3-FedRegNoticeSolarPEIS_2009-07-02.pdf
[36] Ibid.
[37] Solar Energy Development Programmatic EIS. "Priority Development Area (Solar Energy Zone) and Variance Area Maps." http://solareis.anl.gov/maps/alternatives/index.cfm

in the SEZs.[38] They did so by designating 17 SEZs with according parcels for competitive leasing that would require EA approvals.[39] The finalized PEIS created an "umbrella" in order to tier EAs to the broader analysis of potential impacts.[40] The PEIS' completion in July 2012 established a Western Solar Plan that has acted as a guide for solar energy project development in six Southwestern states including Arizona, California, Colorado, Nevada, New Mexico, and Utah as seen in Figure 3.

Figure 3. Map of the set of 17 Solar Energy Zones established by the PEIS. *Courtesy of BLM.*[41]



Building on the intentions of the PEIS, a large-scale planning effort to facilitate renewable energy development and desert resource conservation took hold in the state of California in July 2011. DOI approved the programmatic EIS for the Desert Renewable Energy and Conservation Plan (DRECP), a multi-use, multi-project plan located in the desert of

[38] Bureau of Land Management. "Why the Solar PEIS Is Needed." accessed March 11, 2018, http://solareis.anl.gov/eis/why/index.cfm.
[39] Bureau of Land Management. "Solar Energy Zones." http://solareis.anl.gov/eis/why/index.cfm.
[40] Roger Hansen and Theodore Wolff. "Making NEPA More Effective and Economical for the New Millennium." Federal Facilities Environmental Journal Volume 11, Issue 3. January 10, 2007. https://doi.org/10.1002/ffej.3330110307
[41] Arizona Geology. "Two Solar Energy Zones approved for Arizona BLM lands." October 31, 2012. http://arizonageology.blogspot.com/2012/10/two-solar-energy-zones-approved-for.html

Southern California, in September 2016 yielding 388,000 acres of Development Focus Areas designed for 27 GW of renewable capacity development.[42] In the EIS Scoping Report, the DRECP Planning Agreement detailed that the programmatic EIS intended to "provide a framework for a more efficient process by which proposed renewable energy projects [would] obtain regulatory authorizations and which results in greater conservation values than a project-by-project, species-by-species review would have."[43] Minimization measures for shortened DRECP project approval times were established through the BLM Land Use Plan Amendment. Although the DRECP programmatic EIS concluded after 52 months (4.33 years), the plan intends to deploy 22.5 GW of solar energy capacity by 2025 according to Linda Campbell, the DRECP program manager. As of March 2018, BLM published a Notice of Intent (NOI) to conduct an EIS for the review of a 350 MW solar project.[44]

The Renewable Energy Action Team (REAT) formed by BLM, the U.S. Fish and Wildlife Service, the California Energy Commission and the California Department of Fish and Wildlife, demonstrated how dynamic, transparent coordination can achieve federal and state renewable energy goals. REAT agencies worked together to approve DRECP specific goals and dates for later projects.[45] The construction of plan guideline specifics was time oriented to induct a plan with an approval structure for developers.[46] This way of processing both the DRECP and

[42] Desert Renewable Energy Conservation Plan. "DRECP FAQs." http://www.drecp.org/faqs/DRECP_FAQs.pdf
[43] Desert Renewable Energy Conservation Plan. "Appendix T: Scoping Report: DRECP Environmental Impact Report/Environmental Impact Statement." http://www.drecp.org/draftdrecp/files/Appendix_T_Scoping_Report.pdf
[44] Scott Streater. March 9 2018. "BLM, in rarity under Trump, analyzing new Calif. project." https://www.eenews.net/greenwire/stories/1060075957/search?keyword=BLM%2C+in+rarity+under+Trump%2C+analyzing+new+Calif.+project
[45] Anna Bengtson. "Working at the Landscape Scale: Lessons from the Desert Renewable Energy Conservation Planning Process." August 2016. https://deepblue.lib.umich.edu/handle/2027.42/134686.
[46] Ibid., 188.

PEIS has provided a starkly contrasting exhibition of how multi-project planning works versus the approval of one-off projects.

This capstone will analyze and compare the efficiencies of solar energy project approvals tiered from the PEIS and singular solar applications. DOI has received an influx of solar project applications since the early 2000s. By analyzing recent solar project approvals, this capstone seeks to determine the most comprehensive way to streamline NEPA approvals for the future.

Methods

For the quantitative portion of my research, I evaluated the time needed to approve a solar EIS as compared to a programmatic EIS based on the project's authorized power. In doing so, I determined that a ratio of approved power over months needed to finalize a project would suitably quantify the benefits of each project's process of approval. Data was gathered from the Federal Register[47] and the BLM Solar Energy Data website[48] wherein the Notice of Intent (NOI) dates and EIS completion dates of 25 approved solar energy projects from the past decade were compiled to determine the average number of months necessary for establishing an EIS (this excluded transmission).

The EIS approved projects included in the data sample averaged a 23-month time span signaling that, on average, solar energy projects approved in the last decade fall within Executive Order 13807's two-year goal. I then tested the relationship between approved capacity and power over a number of months for EIS completion to answer this hypothesis: MW approved will not influence the time of EIS completion per MW metric. The EIS data, along with a trend line, were

[47] Federal Register. "Document Search." https://www.federalregister.gov/documents/search?conditions%5Bterm%5D=solar
[48] Bureau of Land Management. "Solar Energy Data." https://www.blm.gov/programs/energy-and-minerals/renewable-energy/solar-energy/data

graphed to illustrate the correlation between the power approved for operation and the time invested in conducting an EIS per MW. Upon completing this analysis, I researched the 17 SEZs of the Solar PEIS to evaluate completed EISs against EAs and found that only three EAs have been approved. With such limited data, I determined that it would be unsatisfactory to base a quantitative analysis of 25 EIS cases against three EAs.

A qualitative analysis of the Dry Lake SEZ in Southern Nevada was then performed through interviews with past and current BLM personnel due to the limited implementation of projects tiered from the PEIS. I conducted three interviews by phone and e-mail with NEPA experts. Shannon Stewart is the owner of Stewart Consulting, LLC, a former BLM staffer, and board member of the NAEP. She has worked for over 19 years in NEPA documentation. By phone and through writing, Stewart provided insight into the experience of leasing the Dry Lake SEZ and the EAs that followed to approve the three solar energy projects within that zone: Playa Solar, Dry Lake Solar, and Harry Allen Solar. Ray Brady, a retired manager of the Bureau of Land Management's National Renewable Energy Coordination Office, has been hailed as an "unsung hero" of renewable energy development due to his contributions in instituting the "Smart from the Start" policy amongst other initiatives that pushed for renewable energy integration on public lands.[49] Lastly, a current BLM employee who wished to remain anonymous spoke with me about the work their department has done to implement plans for the SEZs in the Western portion of the United States.

I pursued an examination of the three cases of SEZ energy deployment in order to determine if tiering to the PEIS yielded a more efficient route for project implementation versus

[49] Scott Streater. "'Unsung hero' of renewable energy heads for the exit." October 30, 2015. https://www.eenews.net/stories/1060027213

individual EIS project deployment. Beyond time, the analysis focused on principles of the NEPA process including public participation, communication, EA costs, and EA approval timespan.

Results

For the quantitative portion of the analysis, a metric of approved power over months needed for EIS approval was tested against project power in order to determine if approved power influences the length of time necessary for approval. Table 1 lists the 25 projects that comprise the data sample, the approved power values and the efficiency ratio of approved power over months needed for EIS approval. A positive correlation of 82% existed between the two variables. In Figure 4, the strong correlation between increased power and decreased approval time per MW can be viewed by the line of best fit. The R^2 value of 0.6745 indicates that the trend line explains a significant portion of the data.

Table 1. Project power correlated with EIS approval time (MW/month)[50]

Solar Energy EIS Approved Projects	Approved Power (MW)	Approved Power/Month of EIS	
Quartzsite Solar	100	3	
Panoche Valley	130	3	
Chevron's Lucerne Valley (T12/31/12)	45	3	
Aiya Solar	100	6	
NV Solar's Silver State Solar South	250	5	
NV Solar's Silver State Solar North	50	1	
SolarReserve's Crescent Dunes	110	8	
Rice Solar	150	9	
EDF RE's Desert Harvest Solar Project	150	11	
First Solar's Stateline Solar	300	11	
Soda Mountain	287	9	
Brightsource's Ivanpah (Solar Thermal) (SEGS)	370	12	
NextEra's Sonoran Solar Project	300	11	
First Solar Moapa Solar Plant	250	18	
Maricopa Sun Solar Complex	700	19	
Genesis Solar (Solar Thermal)	250	25	
Palen Solar I	500	28	
Amargosa Farm Road	484	30	
Tessera's Imperial Valley (former Stirling Energy Systems (SES) Solar 2)	709	32	
First Solar's Desert Sunlight Solar Farm (DSSF)	550	34	
McCoy Solar Energy Project	750	47	
Solar Millennium's Blythe	485	54	
Topaz Solar Farm	550	55	
San Diego Gas and Electric's Ocotillo Sol Solar	20	1	
K Road's Calico (Solar Thermal)	663.5	47	
		Correlation	0.821

[50] Ibid.

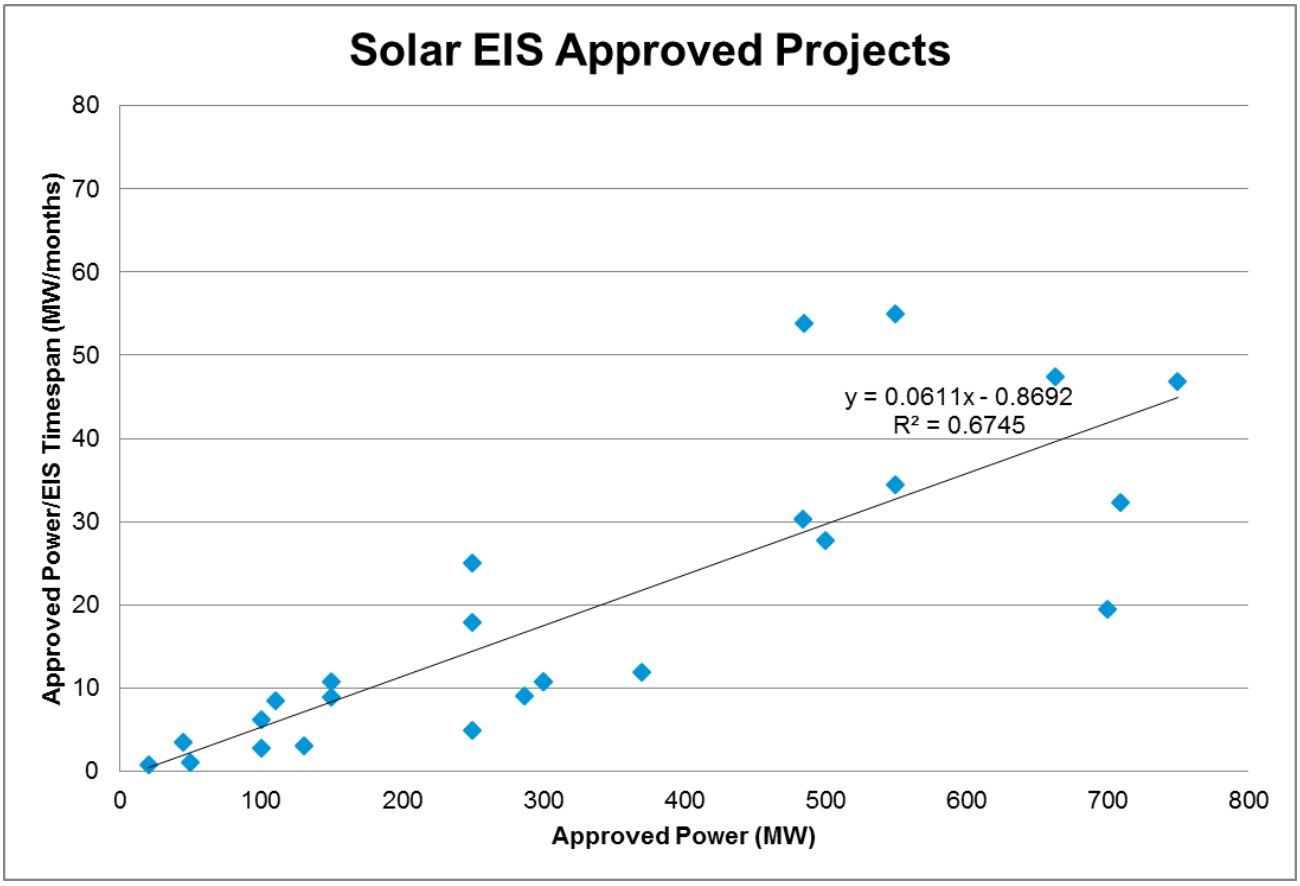


Figure 4. Analysis of solar EIS projects' approved power over time ratio

A linear regression was run in STATA to future project approval implications based on the derived data of currently approved EIS projects. Table 2 shows the regression of approved power as the independent variable and a ratio of power over months needed for EIS approval as the dependent variable. The value of the slope indicates a positive relationship in which the addition of 1 MW to a project will increase the time needed for approval of that additional MW by 0.061 months (1.86 days). The standard error value of 0.009 is minimal indicating that the estimates derived from the approved power variable are accurate.

The p-value of 0 indicates that the coefficient is statistically significant. It was expected that the linear regression would be statistically significant since there was a strong correlation

between the two variables. The null hypothesis was such that approved power does not affect the ratio, so because the p-value is essentially 0, the null hypothesis was rejected. As approved power increases, the efficiency ratio will also increase meaning that the more power is approved for a solar energy project the greater the efficiency of the project approval. Therefore, a higher approved power will yield a decrease in time needed to approve each MW of a solar project as compared to smaller projects which also go through the EIS process.

Table 2. Results of the linear regression between approved power and efficiency metric

	Coefficient	Std. Error	t Value	P> | t |	95% Confidence Interval	
Value	0.061027	0.0094473	6.46	0.00	0.0414345	0.0806195
Intercept	-0.8944054	3.85935	-0.23	0.82	-8.898208	7.109397
R-squared = 0.6548, Adjusted R-squared = 0.6391						

The data plot displayed in Figure 5 exhibits the approved power over time ratio of the DRECP versus the 25 solar EIS projects along with their trend line from Figure 4. The analysis found that, by investing in the creation of the DRECP, a programmatic EIS, the average approved solar power output per major project increased by a factor of 60. The DRECP's rate of approval was 440 MW per month. A 22.5 GW project seeking approval at the rate of the EIS metric would require roughly three times the DRECP rate for approval. The high efficiency rato of the DRECP illustrates the streamlined nature of programmatic EIS approvals. The DRECP, as a programmatic EIS, will facilitate the processing of further project specific EIS approvals. Although the difference in time efficiency is substantial, it should be noted that the completion time of the DRECP programmatic EIS approval was twice as long as the average finalized EIS

timespan and specific projects will require EA/EIS approval to complete the NEPA process.

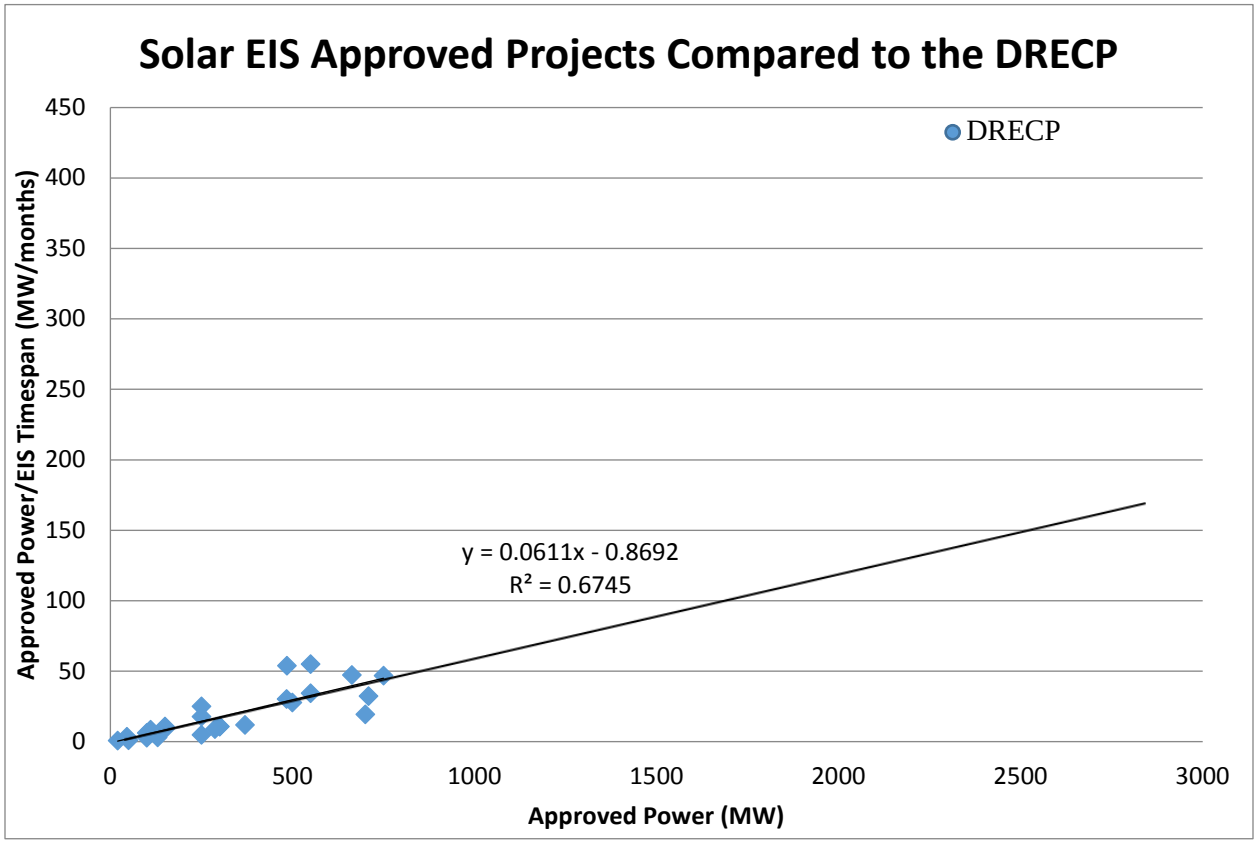


Figure 5. Analysis of solar EIS projects' efficiency ratio compared to the programmatic DRECP

Case Study

PEIS Scoping

As noted in the Introduction, BLM and DOE co-led the preparation of the solar PEIS beginning in May 2008 by NEPA, CEQ regulations, and the Federal Land Policy and Management Act of 1976.[51] The original scoping period invited agencies, organizations, Native American tribes, and the public to aid in identifying "significant environmental issues" in

[51] Department of the Interior. "Final PEIS for the Solar Energy Development in Six Southwestern States." https://eplanning.blm.gov/epl-front-office/projects/nepa/42099/52092/56785/Final_Solar_PEIS.pdf

determining the scope of the PEIS.[52] The NEPA Task Force has indicated that the public increasingly has demanded "improved access to supporting data and models, particularly scientific and technical information."[53] Better access can allow public commentary the opportunity to provide independent analyses that may significantly improve planning through the identification of data gaps at a time cost.[54]

A BLM employee involved in the PEIS processes, who requested that their identity is kept confidential, stated that a lack of input from the solar industry was an issue in developing the solar PEIS. Particularly, he referred to the industry as the target audience. The BLM employee has been in contact with members of the private sphere who have voiced discontent with the land chosen as SEZs during the PEIS. Of the 220 solar applications pending during the preparation of the PEIS, only 35 applications were found on parcels within the zones studied revealing that the solar PEIS may not have seriously considered the solar industry's input concerning the solar market.[55] Those project applications included executed Power Purchase Agreements which contained the investment of a significant amount of time and resources.[56]

PEIS Public Commentary

In December 2010, the Federal Register published a Notice of Availability for the Draft PEIS allowing for public comments through May 2011 in which 80,500 comments were

[52] Solar Energy Development Programmatic EIS. "Public Involvement." http://www.solareis.anl.gov/involve/index.cfm
[53] National Environmental Policy Task Force. "The NEPA Task Force Report To The Council On Environmental Quality: Modernizing NEPA Implementation." https://www.energy.gov/sites/prod/files/2016/02/f29/finalreport.pdf
[54] Ibid., 14.
[55] David Lazerwitz. "Chapter 13 Renewable energy development on the federal public lands: catching up with the new land rush." http://www.fbm.com/files/Publication/8b8d96e9-46c4-48f3-98eb-afaf0dd49c05/Presentation/PublicationAttachment/28cb6cc1-2594-4c2b-87b7-aff2cd7ba1de/fb084747-7eca-4780-a453-804579f3d73b_document.pdf
[56] Ibid, 13-20.

accepted.[57] The comments were garnered from the public as well as from cooperating agencies, ranging from federal to local, who offered suggestions on strengthening the certainty regarding the deployment of solar energy projects on BLM administered lands and ways to "increase the utility" of the PEIS.[58] Again in October 2011, the Supplement to the Draft PEIS offered the opportunity to submit public comment and 131,000 comments were accepted until January 2012.[59] The Final PEIS was approved in July 2012 to create a comprehensive document that would allow future development projects to "proceed in a more efficient, standardized, and environmentally responsible manner."[60]

The efficiency of the PEIS was first discussed in NEPA legislation as a planning tool. According to 40 C.F.R. 1502.20, agencies were encouraged to develop and to tier large EISs to "eliminate repetitive discussions of the same issues and to focus on the actual issues."[61] The PEIS sought to include opinion from the public to diagnose whether thousands of acres of land were suitable for solar energy development. However, the integral issue preparers may have overlooked was the necessity of finding demand for their supply. The following case study evaluated the Dry Lake, Harry Allen, and Playa solar energy projects; the three EAs that have successfully tiered from the PEIS, and looked at the efficiency of the PEIS' results to determine if the PEIS is the most effective streamlining tool.

[57] Department of the Interior. "Final PEIS for the Solar Energy Development in Six Southwestern States." https://eplanning.blm.gov/epl-front-office/projects/nepa/42099/52092/56785/Final_Solar_PEIS.pdf
[58] Ibid., 1.
[59] Ibid., 1.
[60] Ibid., 1.
[61] National Environmental Policy Act. Pub. L. No. 40, § 1502.20 (1969). https://www.law.cornell.edu/cfr/text/40/1502.20

Public Participation

Although the PEIS vetted thousands of comments prior to the finalization of the Western Solar Plan, the three-tiered EAs came under scrutiny by the public upon the release of Findings of No Significant Impact (FONSI) documents. According to Shannon Stewart, many commenters called for additional mitigation to reduce the environmental impacts of the solar projects although the impacts were determined to be below significance. Project impacts of relevance may include ecosystem changes, cumulative effects, and economic changes that affect the environment.[62] Additionally, in March 2014, BLM published a Regional Mitigation Strategy for the Dry Lake SEZ in plain language to improve the public's understanding when the three EA processes began their analyses.[63] The report detailed the strategies for reducing impact in the zone as a whole.

Agency officials along with the public questioned how much and what type of public participation was appropriate for a tiered EA when the intensive stakeholder process conducted by the Solar PEIS had occurred just a few years prior. Documents released for public consumption were complex and did not lend much for stakeholder participation. The public's confusion showcased a lack of two-way communication with stakeholders.

The Dry Lake, Harry Allen, and Playa projects generated brief, individual EAs in order to satisfy NEPA requirements during a parallel time frame by varying contractors. The EAs' variations were examined and commented on by stakeholders who found substantial inconsistencies in the documents. The varying layouts of the analyses did not breach NEPA

[62] National Preservation Institute. "NEPA Terminology: 'Significance' under NEPA." https://www.npi.org/NEPA/significance
[63] Bureau of Land Management. March 2014. "Regional Mitigation Strategy for the Dry Lake Solar Energy Zone." http://blmsolar.anl.gov/documents/docs/TN_444_March_2014.pdf

guidelines, yet CEQ regulations require that NEPA documents be presented in a clear format. Formatting proved to be a distraction for stakeholders. In the end, NEPA relies on individual public analyses to fill gaps in scoping and, in this instance, the EAs' content was not evaluated as thoroughly as the structure proving to be a nuisance for effective analysis as a whole.

Stewart found that the developers did not feel inclined to connect with communities to determine stakeholder needs and observations. Although the NEPA process enforces public commentary, it does not advocate for private initiatives in communities in exchange for public approval. Stewart stated that developers always have the opportunity to reach out to the public. Developers, therefore, may benefit from meeting with the public in more informal ways prior to proceeding with NEPA analyses. This tactic can create mutual partnerships that bridge the social gap between those in power within the decision making process and those with environmental degradation concerns to enhance understanding before commentary periods.

Competitive Leases

Through the finalized PEIS, 17 SEZs were established with parcels set for competitive leases for solar energy project development on 285,000 acres of public land.[64] BLM selected the Dry Lake SEZ as its first bidding zone due to its direct access to transmission and Nevada's newly founded initiative to replace coal with renewable generation. Table 3 shows the immense success of the bidding process in which six parcels were up for sale for a total of 3,083 acres. As a result of the competitive auction, the U.S. Department of the Treasury received over $5.8 million in return for leases and a streamlined process for permits.

[64] Ibid., ES-11.

Table 3. Dry Lake SEZ Competitive Bidding Cycle in 2014. *Table courtesy of Shannon Stewart.*

Parcel	Size	BLM Minimum Bid	Successful Competitive Bid	Successful Bidder
One	712 acres	$14,462	$780,000	Invenergy Solar Development, LLC
Two	222 acres	$4,524	$880,000	First Solar Development, LLC
Three	758 acres	$15,406	$1,320,000	First Solar Development, LLC
Four	729 acres	$14,803	$1,460,000	First Solar Development, LLC
Five	507 acres	$10,309	$1,175,000	NV Energy
Six	152 acres	$3,101	$220,000	NV Energy

The competitive leasing structure granted bidders an immediate lease to the parcels won in auction. The bidder then completed the designated NEPA review for project approval. An EA was determined necessary to tier from the PEIS analysis as long as no new major environmental issues not covered by the PEIS were found.

As reported in the 2003 NEPA Task Force Report to the CEQ, an EA typically costs between $50,000 to $200,000.[65] According to Stewart's estimations, the average cost of the EAs

[65] National Environmental Policy Task Force. "The NEPA Task Force Report To The Council On Environmental Quality: Modernizing NEPA Implementation." https://www.energy.gov/sites/prod/files/2016/02/f29/finalreport.pdf

produced by contractors for the successful bids were $80,000 each. This amounts to a government cost reduction of $240,000 to process permitting on public lands. This reduction does not include the cost savings produced by completing multiple EAs tiered to a programmatic EIS rather than completing individual EISs which typically cost between $250,000 to $2,000,000.[66]

Beyond the cost of the EA, a $500,000 desert tortoise evaluation was passed on to the developers as a negligible oversight. This lapse in judgment was not disclosed until after the competitive bids were placed and won. Understandably, the miscommunication was not appreciated by the developers. However, due to the structure of the PEIS, developers took on the costs of the NEPA process once leases were designated through the competitive leasing structure. According to Stewart, BLM should have done more in preparing parcels for competitive offer.

In order to fund the Dry Lake SEZ's law enforcement and monitoring, a Solar Regional Mitigation Strategy (SRMS) was developed as part of the management structure.[67] The primary reason for the SRMS was to collect funding from developers to minimize the effects of solar development on endangered species, etc. Stakeholders accepted comments and four workshops were held prior to finalization. According to the BLM employee interviewed, the cost per acre was $1,859 and only First Solar has paid into the funding since the mitigation fees are based on land disturbance. The SRMS, therefore, has not effectively obtained funding for mitigation while possibly driving away development from the Dry Lake SEZ.

[66] Ibid., 66.
[67] Bureau of Land Management. "Regional Mitigation Strategy for the Dry Lake Solar Energy Zone." March 2014. http://blmsolar.anl.gov/documents/docs/TN_444_March_2014.pdf

The BLM employee stated that the Dry Lake SEZ and SEZs as a whole are lacking in new applications for approval. Rather, there are 17 applications at different stages of the application process for developing variance lands in Nevada. Variance applications do not receive priority under the PEIS structure, rather the plan allows for a case-by-case basis for siting projects outside the SEZs on the 19 million acres allotted for variance areas.[68] Because of this, the BLM employee found that the SEZs have become more of a hindrance than a help.

The EA Process

The most notable difference in analysis between the 25 solar project EIS approvals and the 3 EAs tiered to the PEIS proved to be their NEPA approval timespans. The average NEPA approval time for the EISs analyzed in the quantitative portion of this capstone was 23 months. According to the Federal Register, the Playa, Dry Lake, and Harry Allen projects' EAs were completed in 9 months. Consistent with the process envisioned by the PEIS, the EAs provided permitting for utility scale facilities within a time span of 6-9 months. Tiering worked so that the EAs functioned as more narrow secondary documents to the PEIS in order to concentrate on the issues specific to each project. As stated prior, as long as a FONSI was determined during the analysis of each project, an EA was determined following NEPA procedures.

Invenergy Solar, First Solar and NV Energy hired consultants to design and conduct the EAs determined necessary for NEPA assessment in March 2014. According to Stewart, BLM did not disclose resource study needs or anticipated mitigation requirements before unveiling the competitive offers for the parcels. Due to the required surveys on threatened species such as the

[68] Department of Interior. "Obama Administration Approves Roadmap for Utility-Scale Solar Energy Development on Public Lands." October 12, 2012. https://www.doi.gov/news/pressreleases/Obama-Administration-Approves-Roadmap-for-Utility-Scale-Solar-Energy-Development-on-Public-Lands

desert tortoise, the three companies had to split an unanticipated cost. Although the developers benefited from the shortened EA approval process, the costs of unrelated surveying were a burden. The developers concluded through meetings with agency officials that combining surveying activities was the best course but did not combine analyses and approvals. The three concurrent EAs contained their own alternatives analysis, public commentaries, and specific findings and concluded around the same time.

According to the CEQ, the preparation of EAs, rather than EISs, has become the most common source of conflict and litigation under NEPA due to diminished interagency partnership building and lack of trust with surrounding communities.[69] With only three projects approved since its finalization, one interviewee has garnered the PEIS as an ineffective tool with good intentions. By withholding the impacts, stakeholder concerns, and procedural requirements linked with the Dry Lake SEZ, the PEIS process failed to communicate effectively with developers who could have factored survey costs and other activities into their bids. Although the plan followed through with the expected 6-9 month approval time span, issues of significance and misunderstandings amongst stakeholders and federal staff proved to be missteps that must be remedied in order to continue processing NEPA approvals in such a timely manner.

Discussion

Following an influx of applications and Presidential directives, goals for implementing solar energy generation on public lands have been met prior to their mandated deadlines due to efforts to streamline the NEPA process. DOI has made renewable energy project implementation a priority through innovative policies such as Smart from the Start and the solar PEIS. Although

[69] Council on Environmental Quality. 1997. "The National Environmental Policy Act: A Study of its Effectiveness After Twenty-five Years." Pg. 19

there are a multitude of possibilities for reform, this capstone determined that there is evidence to support reforming future programmatic planning to streamline development effectively.

The quantitative portion of this capstone calculated that larger solar energy projects directly improve the metric of months per MW of a proposed project. The positive correlation between approved power and the efficiency metric was strong at 82% based on the assessment of 25 projects. With a strong correlation coefficient, it can be determined that the graph demonstrates a general trend for DOI solar project approvals in the last decade.

A higher efficiency ratio for successful power approvals is related to a lower bureaucratic price, or amount of time needed for processing. It can be argued that the NEPA process favors higher powered projects such as the DRECP and PEIS due to the higher efficiency and thus smaller costs required for processing each MW. However, the DRECP has failed to propagate the development of any solar energy projects and the PEIS has yielded the approval of three projects. This is no small issue for such highly regarded endeavors of the Obama-era processes.

Participatory Planning

NEPA legislation emphasizes public involvement to maintain a supportive, democratic process. Yet the environmental review process exhibits a disconnection between government thinking and the public's concerns fueled by complex communication pathways. The inability to close the "social gap," in which the majority of the public supports renewable technologies yet low success rates for development persist, is enhanced by a lack of collective rationality at the political level along with a lack of opportunity for citizen decision making at the local, regional, and national levels.[70] Social scientists Irvin and Stansbury, have argued that enhanced citizen

[70] Derek Bell and et al. "The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses." Environmental Politics 14(4): 460 – 477, August 2005.

participation creates a more democratic and effective society.[71] Public participation processes in decision making have been found to alleviate public confusion and misunderstanding. The evolving practice of involving communities in project proposals and negotiations can become a "transformative tool for social change."[72]

According to the Federal Facilities Environmental Journal, the NEPA process needs to incorporate better participatory planning.[73] The lack of uniformity in agency procedures has proven to be troublesome in releasing digestible information for the public's review.[74] Accordingly, the NEPA Task Force has cited the possibility of misinterpretation, confidentiality breaches, and the issuance of inaccurate information as issues.[75] Ultimately, information released to the public must be of a high quality due to the premise of accuracy implemented by NEPA.[76] However, allotting more time and effort for stakeholder involvement is costly. Ray Brady, past BLM manager, explained that the BLM engages the public at almost every step of the NEPA process. He cited public engagement as the main reason for the "very lengthy process." Shannon Stewart argues that better agency planning on the documentation-side can smooth the participatory process through enforced templates. She explains that by investing in the training of agency staff, a better understanding of the process can be communicated to stakeholders.

https://www.geos.ed.ac.uk/~sallen/jayne/Bell%20et%20al%20(2005).%20The%20'Social%20Gap'%20in%20Wind%20Farm%20Siting.pdf

[71] Irvin, R. A., and Stansbury, J. "Citizen Participation in Decision Making: Is It Worth the Effort?" Public Administration Review, 64(1), 55–65. 2004. https://doi.org/10.1111/j.1540-6210.2004.00346.x

[72] Ibid., 56.

[73] Judith Landry Lee. "NEPA is a powerful collaborative planning process." *Federal Facilities Environmental Journal*, 8(1). 2007. https://doi.org/10.1002/ffej.3330080110

[74] National Environmental Policy Task Force. "The NEPA Task Force Report To The Council On Environmental Quality: Modernizing NEPA Implementation." https://www.energy.gov/sites/prod/files/2016/02/f29/finalreport.pdf

[75] Ibid., 15

[76] National Environmental Policy Act. Pub. L. No. 40, § 1500.1(b) (1969).

Better Practices for Future PEISs and Tiering

In order to improve the efficiency of NEPA approvals, the shortcomings must be addressed and reforms enacted. NEPA environmental reviews are comprised of extremely technical content that can make comprehension difficult for stakeholders. NEPA project managers must ensure that NEPA documents are organized and written as plain as possible for public consumption. Public insight safeguards against future litigation that cannot be foreseen by the small group of officials leading the scoping efforts for energy projects. CEQ has signaled that they will be writing a new handbook in which a writing template could greatly assist agencies in instituting uniformity.

BLM has made a concerted effort to assist renewable energy growth by focusing on large-scale, multi-project plans. The DRECP and PEIS have been approved for a short time. There remains a lot of power capacity to be gained from tiering to these plans with bids on the three EA approved projects reached into the millions. With a clearer understanding of the PEIS and tiering, agency officials will be able to explain EA processes to developers in order to attract more projects with short approval timespans. The stakeholder comments for the Dry Lake, Harry Allen, and Playa projects exhibited how vital communication is in scientific documentation.

It is important to admonish the mistakes of the large-scale planning efforts of the PEIS to mitigate errors for future plans. A lack of solar industry support for the PEIS was a sign of an incomplete scoping period. The inclusion of solar developers in the selection of solar-ready public lands is vital to the successful deployment of future projects. In an effort to streamline processes, federal agencies must continue to look inward at their cost-benefit approaches. Brady said that the PEIS prioritized public lands with the fewest resource conflicts, yet those locations were not the most beneficial for solar developers. It is easy to lose sight of the priority of a

program with such an immense amount of data to interpret along with prioritization of environmental impact reduction. The Obama Administration's goals for energy security and development on public lands instead favored environmental protection of the PEIS selected lands. Thus, the strength of a future PEIS lies in the ability to maintain focus on the industry's needs for renewable energy development while safeguarding public lands. Best practices for future programmatic multi-project plans include:

- Involve the solar industry more carefully during scoping in order to find demand to the supply. When the PEIS was created, there were applications for the BLM's review with PPAs attached to public lands that were not included in the SEZs.

- An investment in agency staff education will enhance public communication and provide more thorough public analyses that will prevent litigation in the future.

- According to NEPA, CEQ has the right to modify regulations although it likely will write new guidance in the form of a handbook. Either way, a consolidated template for processing documents is needed for better stakeholder understanding.

The solar distributed generation market contracted for the first time in 16 years in 2017.[77] Reliance on utility-scale generation is becoming increasingly important to continue integrating renewable resources with the electric grid. DOI has implemented initiatives to streamline major renewable energy project approvals while refraining from diminishing the integrity of NEPA approvals. It is possible this Administration's proposed EIS reforms will not pass legal muster by

[77] Brian Eckhouse. "Tesla Loses Top Spot in Residential Solar to Sunrun." Bloomberg Technology. March 6, 2018. https://www.bloomberg.com/news/articles/2018-03-06/tesla-losing-top-spot-in-solar-to-sunrun-as-musk-shifts-gears

the courts. Programmatic plans can provide valuable tools for project development through existing information and improved guidance. Through lessons learned, future streamlining efforts can build on large-scale programmatic planning to further the drive towards a clean energy economy.

Acknowledgements

I would like to express appreciation to my partner, family, and friends for continued support throughout the course of my Master's candidacy. The topic of large-scale solar energy development is close to my heart and I am indebted to this program and its faculty, especially to program director Prof. Dr. Dan Zachary, for the learning opportunities provided on the matter. I would like to thank my mentor Prof. Dr. Peter Saundry for his guidance and initiative on this topic since I first started writing about solar energy strategies almost two years ago with him. Many thanks go to the professionals who allowed me to interview them on their important work developing processes for renewable energy implementation.

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